REMARKS

This application is a continuation of U.S. Patent Application No. 09/660 279, filed September 12, 2000, which is a continuation of U.S. Patent Application No. 08/807 883, filed February 26, 1997, which corresponds to Japanese Application No. 8-221827, filed August 6, 1996.

The request for continued examination is being filed in order to afford Applicants the chance to present amended claims for consideration by the Examiner. Claims 38 and 40 have been amended to be further distinguished from the cited prior arts. No new matter has been added.

The Office Action dated August 18, 2009 has been reviewed, and reconsideration of the application and allowance thereof are requested based on the following remarks.

Claims 38-41 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Yamashita et al. U.S. Patent No. 4 795 239 in view of Majima et al., U.S. Patent No. 4 938 570.

Claim 38 is directed to a method of driving a nematic liquid crystal for a liquid crystal display device having a liquid crystal panel sandwiching nematic liquid crystal between two electrodes that are disposed between two polarizing plates, comprising:

> applying a voltage corresponding to image data between the two electrodes and thereby depicting an image on the liquid crystal panel; and
>
> applying an appropriate voltage between the two electrodes in each frame period, and thereby erasing the image depicted by the voltage corresponding to the image data on the liquid crystal panel within the same frame period. (emphasis added)

In contrast, Yamashita teaches a method of driving a panel of an active matrix type using source lines and gate lines, and an opposite common electrode common to said panel and opposite thereto, comprising the steps of:

generating an invention control signal which is inverted every time a horizontal sync signal is applied on the input side of the source line; and

driving the common opposite electrode synchronously with said inversion control signal.

Yamashita also discloses in column 1, lines 6-11, a display panel having an active matrix base plate, and a liquid crystal display panel for displaying a multivalue. However, Yamashita does not teach the liquid crystal panel sandwiching nematic liquid crystal between the two electrodes disposed between two polarizing plates.

Yamashita teaches the source voltages (S1'~Sm') of the liquid crystal panel. In addition, Yamashita discloses that the voltage applied to the liquid crystal becomes the difference between the voltage of the common opposite electrode and the source voltage. However, the source voltages (S1'~Sm') is not the voltage corresponding to the image data. As shown in Figure 5, the voltages (S1'~Sm') are applied to the source electrode rather than between the two electrodes. Also, the source electrode shown in Figure 5 of Yamashita does not sandwich the liquid crystal.

Further, one of the electrodes of the liquid crystal in Yamashita is applied with a voltage of the level at the time when the gate turns on, but the other electrode is a common opposite electrode and applied with the voltage of common opposite electrode (Vito). Thus, the difference of Vs and Vito is the voltage applied to the liquid crystal. That is, the voltage that is a difference (Si'-Vito) between the voltage to one electrode (S1'~Sm') and the voltage to the other electrode (Vito) is applied to the liquid crystal. Both of the voltage of common opposite electrode (Vito) and the source voltage (Vs) are applied to the respective electrode, rather than an appropriate voltage being applied between the two electrodes.

The Examiner admits that Yamashita does not teach the nematic liquid crystal between two electrodes and the

appropriate voltage being applied in each frame period to thereby erase the image depicted by the voltage corresponding to the image data on the liquid crystal panel within the same frame period, and cites Majima to cure the deficiencies.

Majima discloses a graphic image display system allowing image data input through a data input apparatus to be displayed precisely, comprising a scanning laser beam, a thermal liquid crystal cell, and a transparent data touch tablet.

As for the nematic liquid crystal, Majima also discloses in column 4, lines 43-46 that the cyano-biphenyl system liquid crystal changes phase from smectic A phase to a nematic phase, rather than the nematic liquid crystal. The liquid crystal panel in Majima shows a smectic phase at normal temperature, and a laser beam is used for writing, and the applied voltage for writing ranges from 0 to V. Once the writing is carried out, the increase of the temperature causes a disruption of the alignment of the liquid crystal. When the laser beam is interrupted, the liquid crystal rapidly cools down, and the alignment of the liquid crystal returns to the smectic phase with the disordered state of the retained alignment. As a result, the portion exposed to the laser beam is kept opaque. Therefore, the liquid crystal panel in Majima is different from the liquid crystal panel configured to depict images by applying voltages.

Although the Examiner incorporates the nematic liquid crystal in Majima into the LCD system of Yamashita to produce gray levels for producing images, Majima cannot write more than transparent (white) and opaque (black) states and cannot display the gray level images. Further, Majima uses a laser beam for writing, which is a different writing method from applying a voltage corresponding to the image data. Writing by the laser beam can bring about a transition of the liquid crystal from a transparent state to an opaque state, but

cannot return it from the opaque state to the transparent state. To restore the transparent state or to change the depicted binary image to a new image, a complete erasure or a partial erasure must be done. The partial erasure is done for a manually designated part of the image and not for each frame.

The description in column 2, lines 49-68 of Majima merely teaches that the part to be erased is manually designated. However, those images are written by focusing a laser beam on the liquid crystal cell 10, as described in column 4, lines 5-22, while the images of the present invention are depicted by a difference between the voltage values applied to two electrodes. Further, although Majima discloses in column 5, lines 43-52, a full erasure in which it erases the full frame of the image on the liquid crystal cell, and a partial erasure in which it erases only part of the image, the full frame of Majima refers to the full screen, rather than the time frame.

Accordingly, Claim 38 is believed to be patentably distinguishable over Yamashita and Majima, alone or in combination with one another.

Claim 39 depends upon what is believed to be allowable Claim 38, is believed allowable therewith, and includes additional features which further distinguish over Yamashita and Majima. Claim 39 discloses that erasure of the image in each frame period is effected by substantially blacking the liquid crystal panel. As discussed above, Majima does not teach the erasure of the image in each time frame period.

Claim 40 is directed to a method of driving a nematic liquid crystal for a liquid crystal display device having a nematic liquid crystal sandwiched between two electrodes that are disposed between two polarizing plates, comprising:

applying a first voltage corresponding to image data between the two electrodes in each frame period to drive the nematic liquid crystal to a state corresponding to the image data; and

applying a second predetermined voltage between the two electrodes in the same frame period to return the liquid crystal to a predetermined state,

wherein the nematic liquid crystal does not change into a different phase. (emphasis added)

As discussed above for Claim 38, both Yamashita and Majima do not disclose the nematic liquid crystal, and the application of the predetermined voltage between the two electrodes in the time frame period. Further, Yamashita and Majima do not teach that the liquid crystal returns to the predetermined state.

The Examiner asserts that since the liquid crystal is a thermal liquid crystal, depending on temperature the liquid crystal will be of a different phase, such as from smectic to nematic, Majima teaches the nematic liquid crystal. On the contrary, Majima merely explains that when a laser beam is focused on the liquid crystal, a phase transition occurs from a smectic phase to a nematic phase and further to an isotropic phase, due to an increase of the temperature by the laser beam. Thus, Majima does not disclose the twisted nematic liquid crystal.

The liquid crystal panel used in Majima shows a smectic phase at normal temperatures. For writing, the laser beam is used and the applied voltage for writing is 0 V as shown in the Table in column 5. Once the writing by the laser beam is complete, an increase of the temperature causes disruption of alignment of the liquid crystal. When the laser beam is interrupted, the liquid crystal rapidly cools down, and the alignment of the liquid crystal returns to the smectic phase with the disordered state of alignment retained. Thus, the portion exposed to the laser beam is kept opaque (black). Therefore, the liquid crystal panel used in Majima is different from the liquid crystal panel configured to depict images by application of a voltage in the present invention.

Accordingly, Claim 40 is believed to be patentably distinguishable over Yamashita and Majima, alone or in combination with one another.

Claim 41 depends upon what is believed to be allowable Claim 40, is believed allowable therewith, and includes additional features which further distinguish over Yamashita and Majima. Claim 41 discloses that the predetermined state of the liquid crystal is a state for displaying substantial black. Majima does not teach the predetermined state of liquid crystal.

In view of the above, the instant application is believed to be in condition for allowance, and action toward that end is respectfully requested.

Further and favorable reconsideration of this application is respectfully solicited.

Respectfully submitted,

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Encl: None

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